

## **New Zealand: Victoria University of Wellington—101**

House Name: First Light

First U.S. Department of Energy Solar Decathlon



New Zealand is the first country to greet the sun at the start of a new day. The First Light house is designed to harvest this sunlight, reflect the relaxed lifestyle associated with the traditional "Kiwi bach" holiday home, and connect residents with the outdoor environment. The design reflects a relaxed lifestyle in which socializing and connecting with the outdoors are central to living.

### **What's Different?**

- A timber canopy houses 28 monocrystalline PV panels and 40 evacuated tube solar collectors.
- A triple-glazed skylight and large bi-fold doors illuminate the central section of the house.
- Custom-built furniture in the living room can transform to accommodate overnight guests.
- An innovative drying cupboard dries clothes quickly by pumping solar-heated hot water through a heat exchanger.
- Recycled sheep's wool is used as insulation.

### **Future Plans**

After competing in Solar Decathlon 2011, First Light will be repacked and returned by ship to New Zealand, where it will begin its second life as a fully functional home. The house was sold at auction to Susan Wauchop, a Wellington resident and a graduate of Victoria University, who plans to put the house on a plot of land in the Canterbury plains. Susan followed the team and the house—even using a picture of the house as the screen saver on her computer—before purchasing it.

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## **Team Florida: The University of South Florida, Florida State University, The University of Central Florida, and The University of Florida—102**

House Name: FLeX House

First U.S. Department of Energy Solar Decathlon (The University of Florida competed in Solar Decathlon Europe 2010)



Team Florida's FLeX House is a prefabricated prototype that combines the wisdom of Florida vernacular design with modern technology. The house opens up to take advantage of passive cooling during mild months and closes down to take advantage of the highly efficient mechanical systems during months of temperature extremes. This hybrid open-and-closed building type is conducive to a healthy indoor/outdoor Florida lifestyle.

### **What's Different?**

- A 22-panel photovoltaic array rated at 5 kW has one micro-inverter for every pair of panels.
- A liquid desiccant duct system connects to an energy recovery ventilator to dehumidify incoming air.
- Systems control and diagnostic software monitors more than 35 channels of data.
- The landscape provides food, modifies the microclimate, reduces solar heat gain, and prevents storm water runoff.
- Cypress wood louvers and photovoltaic panels shade the roof and walls, minimizing heat gain through the building envelope.

### **Future Plans**

After Solar Decathlon 2011, FLeX House will return to the University of South Florida's Tampa campus, where it will become a solar energy learning center for the Tampa Bay area.

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## **Tidewater Virginia: Old Dominion University and Hampton University—103**

House Name: Unit 6 Unplugged

First U.S. Department of Energy Solar Decathlon



Tidewater Virginia's Unit 6 Unplugged is a modular house that blends seamlessly into a historic center-city neighborhood. Unit 6 is conceived of as part of a larger, six-unit multifamily building. By sharing infrastructure costs between units of the building, this energy-efficient house is made more affordable.

### **What's Different?**

- Highly efficient photovoltaic modules convert more than 18% of sunlight into electrical energy.
- Window and door sensors provide security system information and prevent the HVAC system from operating when either is open.
- Motorized windows allow the transformable porch to be open to the outside or enclosed as a sunspace.
- The rain screen cladding is made of medium-density overlay plywood panels and vertical battens.
- Light switches powered by remote transmitters can be placed anywhere in the house and never require replacement batteries.

### **Future Plans**

After the competition, Unit 6 will return to Norfolk, where it will serve as a design studio shared by architecture and engineering students from both schools. This will continue the collaboration between universities and disciplines fostered by Solar Decathlon 2011.

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## **Team New Jersey: Rutgers – The State University of New Jersey and New Jersey Institute of Technology—104**

House Name: ENJOY House

First U.S. Department of Energy Solar Decathlon



Team New Jersey's ENJOY House suggests a new way of approaching high-performance, energy-efficient residential design. Cutting-edge fabrication techniques meet the age-old technology of concrete in its intelligent design. The roof's inverted-hip shape is calibrated for optimal solar energy and rainwater collection, contributing to an architecture informed by performance criteria.

### **What's Different?**

- The 9-kW photovoltaic system has a target daily electricity output of 36 kWh.
- Concrete panels in all roof, wall, and floor assemblies use varied casting processes.
- Evacuated solar thermal tubes heat domestic hot water and provide preheating for the hydronic radiant floor.
- The angular, inverted-hip roof shape allows for rainwater collection.
- Energy recovery ventilators and dehumidifiers keep cool air inside the house while providing fresh air from outside.

### **Future Plans**

Nonprofit organizations in New Jersey as well as private homebuilders have expressed interest in taking possession of the ENJOY House after the competition. Team New Jersey hopes to determine the house's final destination shortly after Solar Decathlon 2011.

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## **Purdue University—201**

House Name: INhome

First U.S. Department of Energy Solar Decathlon



Purdue University's INhome, short for Indiana home, offers a realistic and balanced vision for ultra-efficient housing. The innovative, yet practical, design meets the needs of a typical Midwestern consumer in today's cost-competitive residential market.

### **What's Different?**

- A self-watering biowall brings the outdoors inside with vertically arranged plants.
- The 9-kW solar photovoltaic system is driven by 36 240-W panels.
- The house incorporates interior finishes that contain pre-consumer and post-consumer recycled content.
- A multi-process air purification system removes airborne contaminants from the indoor environment.
- With the central control system, any smart phone can remotely and securely operate the door locks, change the temperature settings, turn on lighting, and display electricity consumption.

### **Future Plans**

After the Solar Decathlon, the INhome will be placed in an existing neighborhood in Lafayette, Indiana, as part of a broader revitalization effort. The team will work with a nonprofit community organization so that a local family can live in it. Although the INhome will be a private residence, it will also be used for educational outreach and long-term monitoring to validate its performance.

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## **The University of Tennessee—202**

House Name: Living Light

First U.S. Department of Energy Solar Decathlon



The University of Tennessee's Living Light incorporates the knowledge of Tennesseans past and present. Although the forms and spaces of Living Light were inspired by the cantilever barns of southern Appalachia, the systems in the dynamic façade and integrated roof array are scalable and tunable to a range of climates and applications.

### **What's Different?**

- Cylindrical modules in the 10.9-kW photovoltaic array capture sunlight across a 360° surface.
- The dynamic double façade system is made of alternating translucent and transparent panes and horizontal blinds.
- The blind system, sandwiched between two panes of glass, is programmed to provide year-round lighting and shading.
- Sensors automatically manage the electric lighting, which includes color-changing LED strip lights along the façade.
- A home automation system can be programmed with preferred conditions for activities such as watching a movie or entertaining dinner guests.

### **Future Plans**

Living Light will tour Tennessee to demonstrate energy efficiency and other technologies to the public. Upon completion of the tour, the team and its collaborators will use the house as a laboratory for collecting data, analyzing energy efficiency, and testing new technologies. The knowledge gained from continued study of the house's performance will benefit the university, regional manufacturers, and research partners.

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## **Middlebury College—203**

House Name: Self-Reliance

First U.S. Department of Energy Solar Decathlon



Self-Reliance is a two-bedroom, ultra-efficient, 990-ft<sup>2</sup> house designed for a family of four. It features a green wall for growing plants, open family living space, and healthy building materials. Its traditional gable, or peaked roof, is a familiar form that holds a 7.2-kW photovoltaic array.

### **What's Different?**

- Triple-paned windows with cork-insulated frames have an R-value of 7 and a solar heat gain coefficient of 0.53, which allows them to provide net heat gain over the course of a year.
- An air-to-air heat exchanger circulates air through a network of aluminum ducts and feeds the green wall with condensed moisture.
- A lofted area above the living room provides additional storage or a place for children to play.
- Local materials used in the house include sugar maple hardwood floors sustainably harvested from college-owned forests and naturally finished heathermore slate quarried in Southern Vermont.
- The house splits into two floor modules and six roof modules that are structurally independent of one another.

### **Future Plans**

Self-Reliance will settle onto Porter Field Road on the Middlebury College campus for permanent use as a student residence. Interested students will apply to live in the house in groups of four each semester. During their stay, residents will engage in community outreach projects related to the mission of the house. They will be encouraged to cook meals made with produce from the green wall and planters and to invite architects, authors, environmentalists, and other speakers to visit.

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## **Parsons The New School for Design and Stevens Institute of Technology—204**

House Name: Empowerhouse

First Solar Decathlon



Parsons the New School for Design and Stevens Institute of Technology developed their solar-powered house in partnership with Habitat for Humanity of Washington, D.C., and the D.C. Department of Housing and Community Development. The house minimizes energy demand by optimizing the building envelope, using a highly efficient micro-mechanical system, and incorporating strategic lighting and daylighting.

### **What's Different?**

- The shape, building envelope, window placement, and shading were optimized through feedback from energy modeling.
- Green roof modules are integrated into the electric photovoltaic system to modulate the temperature extremes on the roof.
- A Light Loft provides separation from the main household area while allowing light to reach the space below.
- A public north porch at the street front invites residents and neighbors to congregate, while a private south porch includes a built-in storage unit with composting and a cooking surface.

### **Future Plans**

Following the Solar Decathlon, the competition house will be moved to the Deanwood neighborhood east of the Anacostia River in Washington, D.C. It will be expanded into a two-bedroom unit and joined with a second unit to create a two-family home.

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## **Appalachian State University—205**

House Name: The Solar Homestead

First U.S. Department of Energy Solar Decathlon



Appalachian State University was inspired by traditional Appalachian settlements for its U.S. Department of Energy Solar Decathlon 2011 entry. The Solar Homestead is composed of multiple buildings that form a self-sufficient ensemble. Inside, the 833-ft<sup>2</sup> (77-m<sup>2</sup>) house features two bedrooms, a day-lit bathroom, energy-efficient appliances, and a versatile living and dining area.

### **What's Different?**

- Six outbuilding modules connect to form the Great Porch, an outdoor living space protected by an 8.2-kW trellis of bifacial solar cells.
- Forty-two photovoltaic panels supply the house and outbuilding modules with solar energy while providing filtered daylight and protection from the elements.
- The adaptable, conditioned Flex Space—which features a half-bath, outdoor shower, and outdoor kitchen—can serve as a home office, guest suite, or cabin retreat.
- A reinvented Trombe wall uses fins containing a phase-change material to passively collect heat throughout the day and radiate it inside at night.
- A solar thermal skylight above the bathroom provides hot water for the house.

### **Future Plans**

After competing in Solar Decathlon 2011, the Solar Homestead will travel the state of North Carolina to promote renewable energy education. The team will teach visitors the value of sustainable technology and environmental preservation. When the tour concludes, the house will return to Appalachian State University to serve as an educational tool for future Mountaineers.

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## Florida International University —206

House Name: perFORM[D]ance House

Second U.S. Department of Energy Solar Decathlon (2005)



The ever-changing nature of Florida International University's perFORM[D]ance House is driven by environmental conditions, resulting in an interactive performance that showcases sustainable strategies and technologies. The open pavilion design incorporates lightness and spatial continuity reminiscent of Paul Rudolph's Cocoon House.

### What's Different?

- Operable louvers raise and lower as needed for privacy, shading, and protection against hurricane-force winds.
- A weather station with monitoring capabilities allows homeowners to monitor energy production and use, solar panel performance, and water consumption.
- A ductless air conditioning system uses micro-climate zoning to increase comfort while decreasing load.
- Bio-remediating beds treat storm-water runoff collected from the roof using native landscaping that filters sediment, reduces runoff, and oxygenates water.
- Sensors, timers, and remote controls provide system automation that increases efficiency and reduces operation and maintenance costs.

### Future Plans

After the house returns from Solar Decathlon 2011, it will be installed on the Modesto A. Maidique Campus of Florida International University in Miami. The perFORM[D]ance House will support the university's Office of Sustainability by serving as a visitor center pavilion and promoting the university's mission for sustainability.

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**Canada: University of Calgary—301**

House Name: TRTL – Technological Residence, Traditional Living  
Second U.S. Department of Energy Solar Decathlon (2009)



TRTL is a unique response to the culture of Treaty 7 Native Peoples in Southern Alberta. Inspired by the tipi, the house's rounded form, east-facing entrance, and south-facing windows relate to the sun as a traditional source of energy and life. The two-bedroom, open-concept design is flexible and includes ample space for storage, recreation, and communal gatherings for meals.

**What's Different?**

- An 8.3-kW photovoltaic system operates at 93% of its optimal efficiency for high performance in Alberta's harsh winter climate.
- TRTL uses healthy, safe, and durable materials to achieve a projected lifecycle of 75–100 years.
- The interior design incorporates materials and color palettes that reflect customary art and the natural environment.
- Magnesium oxide-based structural insulated panels are highly resistant to fire and mold.
- The house was blessed by the former chief of the Piikani Nation, Reg Crowshoe, in a traditional ceremony that resulted in the project's Blackfoot name—Spo'pi—which means turtle and translates directly into "lives on stilts."

**Future Plans**

To ensure the greatest impact, Canada is exploring opportunities to place TRTL on campus or in the surrounding community. This effort is being guided by its university, community, and sponsor stakeholders as a continuation of the project's collaborative spirit. A legacy team is also being built to develop and implement future plans, including post-competition monitoring, LEED certification, lifecycle analysis, and design refinement based on lessons learned.

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## **Team Belgium: Ghent University—302**

House Name: E-Cube

First U.S. Department of Energy Solar Decathlon



Team Belgium aimed for simplicity with E-Cube. This approach resulted in a design that is stripped of its nonessential components and finishes, leaving its structure and façade exposed to the interior. The ultra-efficient house is conceived as an affordable building kit that can be assembled in days rather than months.

### **What's Different?**

- A standard pallet rack system creates the main structure using a bolt-less assembly process.
- The façade made of fiber-cement boards has the same dimensions as the triple-glazed window elements.
- A plug-and-play electrical wiring system is integrated into the structure for easy installation.
- The floor plan can be expanded by adding more floor panels on the existing beams.
- A spacious and luminous raw interior avoids most conventional finishes.

### **Future Plans**

Although future plans are not finalized, the house will return to Belgium after the competition. The aspiration is to reconstruct it on campus, where it can be given a useful purpose such as a research space or a house for visiting faculty.

### **Team Information**

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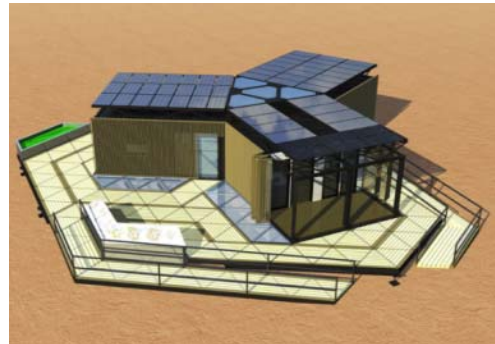
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**Team China: Tongji University—303**

House Name: Y Container

First U.S. Department of Energy Solar Decathlon



Team China's Y Container combines six recycled shipping containers into a succinct, Y-shaped solar house. Y Container is easy to transport, assemble, and expand—providing the freedom to live anywhere with low costs and clean energy. It is a living house that can contain the energy, water, and plants required for an individual to enjoy an independent and natural lifestyle.

**What's Different?**

- An integrated system uses heat recovery from the solar thermal collector for the domestic hot water supply and the floor heating system.
- Vacuum insulation and phase-change materials block heat transfer and moderate the interior temperature passively.
- A natural ventilation tunnel in the middle of the house regulates air distribution without energy consumption.
- Y Container uses standard shipping modules and special conjunction components to help people expand their living space according to their wishes.

**Future Plans**

The house will be transported back to Tongji University after the competition. It will be combined into the new Green Energy Exhibition Area of the campus. If possible, research will continue to maximize the potential of this design.

**Team Information**

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## University of Maryland—304

House Name: WaterShed

Fourth U.S. Department of Energy Solar Decathlon (2007, 2005, 2002)



Inspired by the Chesapeake Bay ecosystem, the University of Maryland's WaterShed house is a model of how the built environment can help preserve watersheds everywhere by managing storm water onsite, filtering pollutants from greywater, and minimizing water use. The photovoltaic and solar thermal arrays, effectiveness of the building envelope, and efficiency of the mechanical systems make WaterShed less thirsty for fossil fuels than standard homes.

### What's Different?

- A modular constructed wetland helps filter and recycle greywater from the shower, clothes washer, and dishwasher.
- A green roof slows rainwater runoff to the landscape while improving the energy efficiency.
- A garden, an edible wall system, and a composting station illustrate the potential for a complete carbon cycle program.
- A liquid desiccant waterfall serves as a design feature and provides humidity control.
- A home automation system monitors and adjusts temperature, humidity, lighting, and other parameters to provide maximum function with minimal impact on the environment.

### Future Plans

At this time, the University of Maryland is seeking a buyer for WaterShed.

### Team Information

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## University of Illinois at Urbana-Champaign—305

House Name: Re\_home

Third U.S. Department of Energy Solar Decathlon (2009, 2007)



The University of Illinois at Urbana-Champaign returns to the Solar Decathlon with Re\_home, a rapid-response solution for a family affected by natural disaster. By combining good design, smart planning, and low-cost solutions, the Re\_home responds to the physical and emotional needs of impacted families while bringing environmentally aware living to the forefront of a community-led recovery effort.

### What's Different?

- The house consists of two modules that can be transported on one trailer for a rapid response to disaster situations.
- The 7.2-kW PV system includes bifacial hybrid cell modules over the front façade and 24 monocrystalline adjustable modules on the roof.
- Conditioning system fans exchange interior and exterior air while energy is recovered across the heat-pump refrigeration cycle.
- The exterior paneling, which can be personalized with different finishes, is made from 60% rice husks, 22% common salt, and 18% mineral oil.
- The two large deck spaces and a ramp are made from reclaimed wood.

### Future Plans

The team is working with the University of Illinois to determine the best use for the Re\_home in the future. Ideally, the team would use the house for its intended purpose by offering it to a family in need.

### Team Information

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**Team Massachusetts: Massachusetts College of Art and Design and the University of Massachusetts at Lowell—401**

House Name: 4D Home

First U.S. Department of Energy Solar Decathlon



Team Massachusetts designed the New England-inspired 4D Home using efficiency technologies and passive strategies without compromising simplicity. This solar-powered prototype is an affordable, ultra-efficient house that can adapt to a family's changing needs.

**What's Different?**

- The 28-panel photovoltaic array is made of monocrystalline silicon cells that are 19.1% efficient.
- Hybrid solar thermal panels mounted behind the photovoltaic modules allow for efficient heat transfer to the domestic hot water system.
- Blown fiberglass and closed-cell polyurethane spray foam insulation provide air tightness.
- Asymmetrical timber trellises provide seasonal shading and a covered transition to the interior.
- A two-bedroom layout is easily reconfigured by two sliding partition walls.
- Student team members designed and fabricated furniture, decor, and housewares throughout.

**Future Plans**

Team Massachusetts is committed to finding a family to purchase and live in the house immediately after the competition. The home will be located in New England, where its performance will be monitored as the family lives in it.

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## **The Southern California Institute of Architecture and California Institute of Technology—402**

House Name: CHIP

First U.S. Department of Energy Solar Decathlon



CHIP is a real-life application of green design in the modern world that offers a solution to the challenges of home ownership and energy consumption. While appearing to be a house of the future, this “prototype to product” is ready to be injected into the Los Angeles landscape after it returns from Washington, D.C.

### **What’s Different?**

- A vinyl-coated fabric mesh protects the house and contains the “outsulation” that envelops the structure.
- The interior is stepped in multiple levels to distinguish one space from another without compartmentalization.
- A whole-house fan performs a complete air change in less than 20 minutes.
- A custom iPad application displays real-time energy use, controls the shades, and provides instant feedback.
- 3-D cameras track movement in the house and adjust the lights accordingly.

### **Future Plans**

Following the competition, CHIP is slated to be part of various museum and public exhibits throughout California to educate and excite visitors. Ultimately, the house will be owned and lived in by a permanent resident. The team firmly believes in the philosophy of “prototype to product” and views CHIP as a current reality of clean living.

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## **Team New York: The City College of New York—403**

House Name: Solar Roofpod

First U.S. Department of Energy Solar Decathlon



Team New York's Solar Roofpod responds to the fact that urban rooftops are largely under-used. Intended for existing mid-rise buildings, the house enables eco-conscious city dwellers to live lightly by producing solar power, cultivating roof gardens, and retaining and recycling storm water.

### **What's Different?**

- The one-story penthouse has variable cladding options—including glazed, opaque, louvered, and screened—that can be custom-assembled on its 64 poplar wood-framed “building blocks.”
- A rooftop-mounted solar trellis protects the house from heat gain and is easy to upgrade with new photovoltaic technologies.
- A power and water use indicator helps residents monitor their daily consumption.
- A micro-inverter for each solar panel helps optimize system output.
- Solar thermal collectors distribute the sun's heat through a radiant floor system.

### **Future Plans**

There are two possible future scenarios for the prototype Solar Roofpod. The house may return to The City College campus in West Harlem for use as a visitor center and classroom for sustainability education. It could also become part of the school's planned environmental science center on Pier 26 in Tribeca along the Hudson River.

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## **The Ohio State University —404**

House Name: enCORE

Second U.S. Department of Energy Solar Decathlon (2009)



The Ohio State University's enCORE house presents a family-friendly solution for residential needs while addressing the world's growing energy problem. enCORE features living spaces arranged around a central core that contains the house's mechanical and plumbing systems. The flexible, interconnected design gives this 930-ft<sup>2</sup> (86-m<sup>2</sup>) solar-powered house the same functionality and livability of projects much larger in size and budget.

### **What's Different?**

- The 8-kW photovoltaic array consists entirely of thin-film panels manufactured locally in Toledo, Ohio.
- A simple touch-screen user interface controls the lighting, mechanical, electrical, and plumbing systems.
- A flat-plate solar thermal collector combines with a heat pump water heater to further improve energy efficiency.
- An adjustable exterior screen provides privacy and protection from the sun.
- A reflecting pond collects rainwater from the roof and feeds it into the water filtration, or bioremediation, system.

### **Future Plans**

Following the competition, enCORE will return to The Ohio State University campus to serve as an educational tool. After one year, the house will be sited in a low-income neighborhood, where it will become a family residence.

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